

REMARKS

Claims 1-3, 5-11, 13, 15 and 16 are now pending in the application. Claims 1, 2, 9 and 13 are amended and claims 4, 12 and 14 are cancelled herein. The Examiner is respectfully requested to reconsider and withdraw the rejections in view of the amendments and remarks contained herein.

REJECTION UNDER 35 U.S.C. § 112

Claim 12 stands rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point and distinctly claim the subject matter which Applicant regards as the invention. This rejection is respectfully traversed. Notwithstanding and solely in the interest of expediting prosecution, claim 12 is cancelled. Accordingly, this rejection is moot.

REJECTION UNDER 35 U.S.C. § 102

Claims 1-7, 10, 11 and 13-16 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Suganuma (U.S. Pat. No. 5,563,478). This rejection is respectfully traversed. Notwithstanding, claims 4 and 14 are cancelled.

Amended claim 1 is directed to a resonance control apparatus 100 that drives a resonant device 3 having a resonance characteristic, in which the resonant device functions as a resonant sensor 2. The apparatus 100 includes: a reference signal generating section 10 that generates a reference signal having a predetermined frequency in response to a voltage signal that is inputted into the reference signal generating section 10; a divider 20 that divides the predetermined frequency of the

reference signal generated by the reference signal generating section 10 to output a signal having a given frequency; a phase reference forming section 50 that delays a phase of the signal outputted from the divider 20 for a predetermined interval; a voltage comparator 40 that compares a voltage of the output signal from the resonant sensor 2 with a predetermined voltage, the resonant sensor 2 detecting the driving state of the resonant device 3 in synchronization with the driving of the resonant device 3; and a phase comparator 60 that compares the phase of the signal outputted from the voltage comparator 40 with the phase of the signal outputted from the phase reference forming section. In this case, the resonant control apparatus 100 further comprises a duty control section 30 that controls a duty ratio of the drive signal provided for the resonant device 3 based on the reference signal outputted from the reference signal generating section 10, the duty control section 30 being constructed to control the duty ratio of the drive signal substantially linearly in the range of either 10%-50% or 50%-90%.

Amended claim 13 calls for similar subject matter. Further, dependent claims 2, 3, 5-7, 10, 11, 15 and 16 inherit this subject matter.

According to the claimed invention, since the resonant control apparatus includes the duty control section for linearly controlling the duty ratio of the drive signal provided for the resonant device in the range of either 10%-50% or 50%-90%, the apparatus can control the duty ratio of the drive signal for normal drive or reverse drive. In addition, for example, even in the case where the apparatus switches between the normal drive or the reverse drive of the resonant device at every switching operation, it is possible to reliably control the normal or reverse drive of the resonant device without carrying out

an oscillating process of the resonant frequency thereof and changing a resonant frequency of the resonant device.

In contrast, Saganuma 478 (USP No. 5,563,478) discloses a drive control device for an ultrasonic motor. In the drive control device disclosed in Saganuma 478, a duty ratio of the drive control device depends upon the phase difference between the output voltage waveforms of the two detector electrodes 14M and 14F (see lines 24-46, column 14). As seen from FIG. 4, the drive control device can merely set the duty ratio based on the phase difference between the output voltage waveforms of the two detector electrodes 14M and 14F. The output signal from the VCO 301 (or the frequency dividing phase shift device 302) cannot be controlled with respect to the duty ratio. For this reason, the drive control device disclosed in Saganuma 478 cannot control the duty ratio of the output signal from the VCO 301 substantially linearly in the range of either 10%-50% or 50%-90% as recited in amended claim 1. Therefore, such a drive control device cannot control the normal or the reverse drive of the ultrasonic motor without carrying out an oscillating process of the resonant frequency thereof and changing a resonant frequency of the ultrasonic motor.

In view of the foregoing it can be appreciated that Saganuma 478 fails to teach or suggest the feature of amended claims 1 and 13, that is, Saganuma does not teach or suggest a duty control section that controls a duty ratio of the drive signal provided for the resonant device based on the reference signal outputted from the reference signal generating section, wherein the duty control section being constructed to control the duty ratio of the drive signal substantially linearly in the range of either 10%-50% or 50%-90%.

REJECTION UNDER 35 U.S.C. § 103

Claims 8 and 9 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Suganuma (U.S. Pat. No. 5,563,478) in view of Suganuma (U.S. Pat. No. 5,767,609). This rejection is respectfully traversed. Claims 8 and 9 depend from claim 1 and should be allowable for at least the same reasons as set forth above. Further, it should be noted that the above arguments are equally applicable to Suganuma 609 (USP No. 5,767,609). That is, both Suganuma references fail to teach or suggest a duty control section that controls a duty ratio of the drive signal provided for the resonant device based on the reference signal outputted from the reference signal generating section, wherein the duty control section being constructed to control the duty ratio of the drive signal substantially linearly in the range of either 10%-50% or 50%-90%.

CONCLUSION

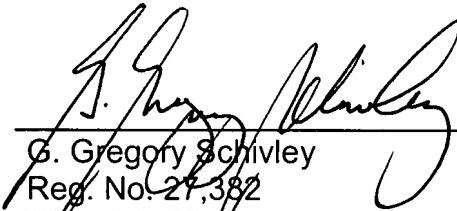
It is believed that all of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. Applicant therefore respectfully requests that the Examiner reconsider and withdraw all presently outstanding rejections. It is believed that a full and complete response has been made to the outstanding Office Action and the present application is in condition for allowance. Thus, prompt and favorable consideration of this amendment is respectfully requested.

If the Examiner believes that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at (248) 641-1600.

Respectfully submitted,

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